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that of the two other Satellites, together with their periods, agrees better with 80 days. Therefore in the *Ephemerid* which we give of one Revolution, we follow this, untill we get a more precise determination, which requires a greater number of Observations, that cannot be begun but towards the next summer Solstice, by reason of the Oblique Ascension of Saturn, and his Southern latitude, which will keep him long in the beams of the Sun.

An Extract of a Letter, Written by David von der Becke, a German Philosopher and Physician at Minden, to Doctor Langelott, Chief Physician to his Highness the Duke of Holstein now Regent, concerning the Principles and Causes of the Volatilisation of Salt of Tartar and other Fixed Salts: Printed at Hamburg, 1672.

THis Learned Author, having exploded the Useless and Empty terms of *Faculties, Qualities, &c.* and recommended the Investigation of Nature by *Experiments* guided by *Reason*; commends, for the practice of this latter, that excellent Naturalist and Physician, Dr. Joel Langelott, in that Discourse of his, touching the great Use of *Digestion, Fermentation, and Grinding* in Chemistry; of which a Breviate was given in *Numb. 87.* of these Tracts. Out of which Discourse he chuseth, before all, to elucidate that part, which treats of the *Volatilisation of Salt of Tartar*, as a Subject, which he had likewise considered and inquired into.

Having therefore (as he affirms, and as will appear by the sequel,) formerly taken pains in the like Fermentation of Tartar for the *Volatilizing the Fixt Salt* thereof, he endeavours here to declare his thoughts about the *Causes* of his undertaking that labour, and of the *Manner* how that Volatilisation is performed. In the doing of which he labours to shew, *first*, The *Causes* of the *Fixation* of the Salt of Tartar: *Secondly*, The *Reasons* of the *Volatilisation*: And *lastly*, what *degree* of *Volatility* the Salt of Tartar hath acquired in that Fermentation made with its own Ferment.

As to the *first*, he begins with blaming those, that divide

Salts into *Fixt* and *Volatil*, forasmuch as, in his opinion, that Division is unknown to Nature, there being not to be formally found in any Body before Calcination any Fixt Salt, such as the Alcalisate Salt of Tartar and other Fixt Salts are, produced by Calcination. He therefore informs us, That Salts that are Volatile before Incineration, are by the action of the Fire, as the Efficient, so colligated among themselves and with the Earthy particles, as to be fixed thereby. For the clearing of which, he presupposeth with some others, that there are Two kinds of Salts, an *Alcali* and an *Acid*, as the genuin Instruments of Nature, by which the several Kinds and Seeds of things are put forth, and which every where are employed in the Germination of Plants, and the first Conceptions of Animals, and in all the beginnings of Fermentations. These two Salts he affirms to be *both* Volatile, and therefore easily resolvable by the supervening Salt of the Air : since it appears, that all Vegetables, especially Aromaticks, if they be any considerable time exposed to the Air, loose their Salts ; and that Wood in particular, by the action of the Air, consuming the Volatil Salt, doth in time quite moulder away. Whilst therefore these Salts are loosen'd and set at liberty by the fire, (for else they would not act,) they begin to operate on one another; the Volatil *Acid*, whilst it works upon the volatil *Alcali*, fixeth it, and they are colligated together. Which operation of Nature being well observed, it will be manifest, that that received Axiome, *Things Volatil are fixed by those that are Fixt, and things Fixt rendered volatil by those that are Volatil*, is false. Now, that Volatil Salts are consumed by the Air, and colligated by Fire, is so notorious, that Common people are wont to sink in water such Timber as they would preserve from putrefaction, thereby to keep it from Air, and to harden it to a great degree for strong supports of buildings. Hence also they slightly burn the ends of Timber to be set in the ground, that so by the Fusion made by Fire the Volatil Salts, which by the accession of the moisture of the Earth would easily be consumed to the corruption of the Timber, may catch and fix one another. For which reason also, namely the fusion of the same volatil Salts, Ship-wrights are wont to burn the lowermost

ermost part of **Ships**, that lyes under water. And to use a very common **Instance**, *Soot* ; 'tis known, that whilst the **Wood** is burning, the **smoak** ascends, wherein the two Volatil Salts are contain'd, that coagulate one another into **Soot**, which two Salts may thence easily be separated and made visible ; and these Volatil Salts, constituting the **smoak** and the **soot**, rise so long, untill the wood be quite reduced to **Ashes**, in which the remaining Volatil Salts are colligated to a **Fixt Salt**, easily to be wash't out by water. These two Volatil Salts therefore afford the matter, of which the **Fixt Salt** is made by means of the **Fire** : Whence 'tis evident, that we must, (as really we do,) obtain so much the more **Fixt Salt**, the more Volatil Salt there was before **Incineration** in the **Mixt Body** ; as also, why out of herbs, freshly burnt to ashes, we get a greater quantity of **Fixt Salt**, than when they have been dryed up ; because the **Air** by its operation (which is somewhat advanced by the moisture in the plant it self, dissolving the Salts,) hath robbed them of the greatest part of their Volatil Salts. Upon which same account, wood decayed and moulder'd away contains almost no **Fixt Salt**, as it hath also lost almost all its weight.

Having thus shew'd, that before **Incineration** there is found in **Mixt bodies** no *Fixt* **Alcalifat Salt** at all, and how the Volatil Salts by calcination are brought to fusion and so fixed ; the Author, further to make out the **Fixation** of such Volatil Salts, takes notice of the *Mixture of Earthy parts* in such bodies ; some of which, when those two Volatil Salts, thus open'd by the **Fire**, act on one another, are con-coagulated with them. Which he conceives to be the case, when the said two Salts being concreted in the **Kidneys**, they by their asperity wound their sanguineous Vessels (whence the **Nephritique pain**,) and so coagulate together with them the extravasated **Blood**, which makes the **Stone** of the **Kidneys** reddish ; as the **Stone** of the **Bladder** is whitish from the mucous substance of the bladder, therefore given it by nature, lest the sharp **Urine** by working upon its membrans should cause pain, being coagulated together. And so he observes, that the **Stones** concreted in the **Bladder** of **Gall**, taste bitter by reason of the **Gall** that is coagulated.

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This Earth then, when by the Fire 'tis intimately united with the Salts, and has been in a manner vitrified with them, keeps them so close together, that they can no more rise and fly away than birds fastn'd to a rock ; those Salts being rendred so fix, that by a gentle fire they are not so much as at all moved ; by a strong one, brought to fusion ; and, united with a considerable quantity of Earthy particles, by an extream degree of heat vitrified. So if you mix fixt Salt of Tartar with Cinnaber of Antimony, or with Quicksilver, all the Quicksilver, though a very ponderous body, will pass into the Retort, but the Salt of Tartar by reason of its Earth remain at the bottom of the Vessel. Whence he esteems it evident, that the Fixt Alcalies, especially that of Tartar, cannot, by reason of the colligation of the Earthy parts, penetrate into bodies to be dissolved, nor consequently remove the inmost seeds of Diseases.

Now, in the *second place*, though the *Volatilizing* such Fixt Salts, and particularly that of Tartar, have been hitherto found a very difficult work ; yet doth our Author conceive it would be very easie, if we took but Nature for our Guide, and but separated from Salt of Tartar the *Fixing Earth*, that has been proved to be mixed with it. For the doing of which he refers to the prescript of Dr. *Langelot*, requiring that the Fixt Salt of Tartar be mixed with its genuin Ferment, *viz.* crude Tartar, or (if in the Fermentation you have a mind to see the grape-like bubbles) Creme of Tartar, and so expos'd to fermentation. In which commixture of Ferment he would have this especially observ'd, that it be mixed to the very degree of *Saturation*, and untill the fermenting agitation and the motion of the saline particles do cease, as a sign, that there is not any particle of the fixt salt of Tartar left un-conjoined with the acid particles of the Crude Tartar or its Creme, nor any acid part of the crude Tartar not Saturated by the Fixt Salt. Which being observed, the Distillation will, the action of the Salin particles being thus stopp'd, the more securely be done. Meantime, that only the Acid particles of the crude Tartar are laid hold on by the Fixt Salt, and not the Alcalifar, he promises a proof of hereafter.

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But since the main Question is about the *New Volatilisation* of the Fixed Salts, the Author is altogether persuaded, that in his Fermentation of Tartar 'tis not chiefly the very *Fixed Alkali of Tartar* that is again volatilised, but rather the added Ferment, which is the *Crude Tartar*. For in this crude Tartar, though there be no fix'd Salt in it, (which he hath asserted generally of all Mixts,) yet the volatil Alcalisate particles of the Tartar are detained by the Volatil Acids of the same, commixed with it to the very degree of saturation; whence they are fixed, forasmuch as these two when conjoined do fix one another, when separated, become again Volatil. Which manner of Fixation he calls *Natural*, being shew'd us by Nature; as that, which is made by the Colliquation of the Earth by Fire, *Artificial*, because only perform'd by Art; upon the account of which, Volatil Salts are detained no otherwise, than Birds tyed to a rock are restrained from flying away.

Now, though indeed the Fixed *Alkali* of Tartar is in this fermentation freed from that Earth, to which by the fusion of the fire it was intimately united; yet notwithstanding this, 'tis fixed again, *saieth he*, by the *Acid* of the Tartareous Ferment. For the clearer proof of which, he makes use of the Urinous Spirit of *Sal Armoniac*, in which there are two Volatil Salts, an Urinous, and Acid. These two Salts, *saieth he*, though they be Volatil when separate, yet when united they detain one another, emulating as 'twere the nature of Fixt ones, since they are neither dissolved in the Air, nor emit any odour, as true Volatils are wont to do. Now to obtain out of this Salt the Urinous volatil Spirit, there is requisite a Separation of these two Salts; for this bond being dissolved, the Urinous immediately riseth. To obtain which, water is powred upon the *Sal Armoniac* (because Salts act not but when dissolved,) and then there is added a Fixt *Sal Alkali*, which whilst 'tis Joined with the Acid portion of the *Sal Armoniac*, (for the more fixed Acid is sooner united with the fixed Alkali, than with the Volatil;) the volatil *Urinous* part quickly deserts its fellow *Acid*, and being conjoined with the water, yields a most volatil and piercing spirit, which, though the *Sal Armoniac* before the

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commixture of the Fixt Salt was quite inodorous, yet now after the addition thereof strikes the nose most violently, and that even when put from the fire; insomuch that if you do not, after the mixing of the Fixt Salt, very accurately close your vessel, you will afterwards find no Spirits at all. Wherefore as in this Example of *Sal Armoniac*, the Fixt salt added, freeth the *Alcalifat* portion of the Salts; so in this Fermentation of Tartar, the Tartar calcined to blackness, or the Fixt salt of Tartar, freeth the *Alcalifat* part of the crude Tartar from the Acid parts. For, *saith he*, in the crude Tartar or its putrified Creme there are, as in *Sal Armoniac*, two Volatil Salts, an Alkali and Acid, from the colliquation of which (as hath been said) the Fixt salt results: since 'tis notorious, that in the fermentation of wine the *Acid* particles do coagulate the superabounding *Alcalifat* with the Terrestrial ones to the very degree of saturation, and so by their increased weight take place in the lower part of the vessels.

If therefore to this Tartar, pregnant with Salts, crude, or depurated by a solution in water, you add a calcined Tartar, or, which is the same, Salt of Tartar it self, immediately this Fixed salt will lay hold on the Acid portion of the crude Tartar, and, as in the *Sal Armoniac*, so here, free the volatil *Alcalifat*; from which conflict and action of the salt on one another, grape-like bubbles will arise. And this injection of calcin'd Tartar must be continued, untill all Fermentation do cease, that is, to the very degree of Saturation: which unless it be well observed, many inconveniences will obstruct the Operator. But this volatil *Alkali*, being by means of the calcined Tartar freed from its *Acid*, (like the Urinous of the *Sal Armoniac*,) will presently fly away. Wherefore if this volatil Spirit could forthwith be received, it would afford a real volatil Salt of Tartar, especially if by art it were freed from its phlegme (which makes it a fluid Spirit,) and, without the addition of any extraneous thing, coagulated into Salt. But this cannot be, *saith he*, seeing that, before all the fermentation and motion of the saline particles shall have ceased, this mixture cannot be put into the Cucurbit, because it would break the vessel; nor can the Fixt salt be added to the dissolved
crude

crude Tartar all at once, but at several times, because else all the fermented part would quickly get out at the edges of the Cucurbit: Now then, since every time there is, by the addition of the Fixt Salt, so much of the Volatil Acid freed out of the crude Tartar, as much as there is added of Fixt Salt, and that presently flies away, it certainly follows, That, if by injections several times repeated you come at last to the point of Saturation, there will remain no volatil Alcalifat salt at all of the crude Tartar.

Since therefore there is no hopes of obtaining the Volatil Salt from crude Tartar this way, we must endeavour to get it by an addition of Tartar calcined, or Fixt Salt; and how this is to be done, hath been already intimated, *viz.* by the separation of the Earthy parts. For as the volatil Alcalifat particles, upon a very vehement colligation of the fire, are, by an intimat union with the Earthy parts, kept from ascending; so also, when freed from these Terrestrial fetters, they are restored to their former freedom and volatility. And this Separation of the Earth we obtain by this Fermentation of the Tartar; for, in the same moment that the Acid portion of the crude Tartar is conjoined with the Tartar's Fixt Salt, to set the Volatil Alkali of the crude Tartar at liberty; there is also made a precipitation of that insipid Earth, which by the extreme degree of Fire was united with the Salt of Tartar, and had fixed it before.

But to expose this Fixing Earth to the view of all, I shall alledge the Example of Vitriolat Tartar, known to the very Apprentices of Apothecaries. In this operation, whilst the Spirit of Vitriol is affused to the dissolv'd Salt of Tartar or its Oyl made *per deliquium*, you may observe a very great Effervescence, during which and the action of the Acid of the Vitriol upon the Alkali of the Tartar, there is precipitated an Earth (for the separation of all which, care is to be had of the degree of Saturation between the Spirit of Vitriol and the Salt of Tartar,) which afterwards may be sever'd by filtration. Now that this Earth is precipitated not out of the Spirit of Vitriol, but rather the Salt of Tartar, none, versed in these things, can be ignorant of. This precipitated Earth some call the Magi-

stery of Vitriolat Tartar, and very impertinently prefer it often in their prescriptions to the true Vitriolat Tartar it self. This Earth indeed hath a Saline taste ; but these Salts, as is usual in all Precipitations, did only adhere to the matter precipitated, and may by a repeated ablution be easily separated ; which done, there remains nothing but an utterly insipid Earth, which can have no other virtue but that of exsiccation. Wherefore after the self same manner, whilst the Acid part of the crude Tartar is united with the Alcalisate of the Salt of Tartar, the Earth also of the Fixt Salt of Tartar in the said fermentation will be precipitated.

The greatest difficulty being thus dispatch't, our Author proceeds in the *third* place to a lesser, yet remaining, which is ; That the *Acid* part, by means of which the Earth was precipitated, detains the volatil Alcalisat part, and fixeth it anew ; so that his Volatil Salt of Tartar hath hitherto acquired no greater degree of volatility, than crude *Sal Armoniac* or the Flowers thereof are known to have. For these, though they are made up of volatil parts, yet they diffuse no odour before the separation of the volatil parts ; they also endure the Air ; which no volatil salts, truly such, will do : Wherefore they cannot yet be reckon'd among Volatils, strictly so call'd.

Now then, to give to this Volatil Alkali of Tartar the last and highest degree of Volatilisation, the Author esteems it necessary, there should be made a New addition of Fixt Salt of Tartar, which in the same manner, as before it had freed the Alcalisat part of *crude Tartar* from its Acid, must here also take from the manifest Acid of crude Tartar the Alcalisat part of the *Fixt Salt of Tartar*, already freed from Earth ; whereby this Alcalisat part of the Salt of Tartar, truly volatilised, being joined to the water (which was before added for the free action of the Salts,) will constitute a most Volatil Spirit, which he saith is coagulable, without addition, into volatil crystals, having the perfect taste of Tartar.

So far this Author of the Volatilisation of Fix't Alkalies, and particularly of Tartar ; concerning which 'tis wish't by some of our Philosophical Chymists here, that this Author would please to make good proof, 1. That all Salts are Volatil before Cal-
cination,

cination, and consequently, that in Mixt Bodies there is no Fixt Alcalifat salt at all, that is originally such, but that all Volatil Salts are fixed by Calcination, by means of which the Earthy parts in them commixed are concoagulated with them; and that upon this ground the Volatilisation of Fixed Salts may be easily perform'd by only separating from them that Fixing Earth, said to be commixed with them. 2. That in the Volatilisation of Salt of Tartar, perform'd by the Fermentation of Dr. *Langelot*, 'tis not chiefly the Fixed Alkali of Tartar, that is again volatilised, but rather the Crude Tartar added for a ferment. 3. That in *Sal Armoniac* there are only those two Salts, which he calls an Urinous and Acid, and both Volatil; whereas 'tis well known, that there is a Sea-salt in it, which contains many parts, that will for a long while endure a strong fire.

Some Observations touching the Nature of Snow, presented to the R. Society by Dr. Nehemiah Grew.

IF those great Philosophers, *Aristotle* and *Cartesius*, and others, of their Followers, who have written of *Meteors*, and amongst them of *Snow*, have not yet given us a full account hereof; it will not be needless to enquire further of it. He that will do this, will do it best, not by the pursuit of his phancy in a Chair, but with his Eyes abroad; where if we use them well fixed, and with good Caution, and this in a thin, calm and still Snow, we may by degrees observe;

First, with Monsieur *Des Cartes*, and Mr. *Hook*, that many parts hereof are of a regular figure; for the most part, as it were, so many little Rowells or Stars of 6 points; being perfect and transparent Ice, as any we see upon a pool or vessel of water. Upon each of these 6 points, are set other collateral points, & those always at the same angles, as are the main points themselves.

Next, amongst these irregular figures, though many of them are large and fair; yet, from these taking our first *Item*, many others, alike regular, but far less, may likewise be discover'd.

Again, amongst these not only regular, but entire parts of Snow, looking still more warily, we shall perceive, that there are divers others, indeed irregular, yet chiefly but the broken points, parcels and fragments of the regular ones.

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Lastly,